Trip Report
Radiological Society of North America Convention
at Chicago's McCormick Place
11/28-30/94
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Display Monitors and Cards

The principal suppliers of gray scale monitors for medical image viewing are Data Ray, MegaScan, Image Systems, and Siemens. Currently, the most popular is 1200x1600x8bit, approximately 12x16" view area, 65 fL (foot Lamberts), 21" tube and is referred to as medium resolution. Higher resolutions are relatively new, 2000x2500x8bit, 12x16" or 14x19" view area, 150-200 fL, 21" or 25" tube.

The principal suppliers of display cards are Dome and TechSource. Dome makes cards for PC (ISA and PCI bus), Mac, and Sun. TechSource makes an external box which connects to the host via an adapter card, currently only Sun, but has plans for PCI bus.

Some claim that 200 fL is needed to display 10-12 bit images and only one company is claiming more that 8bit images displayed; InfiMed claims 10 bit InfiMed board and uses Image Systems Display monitor.

Several systems used standard desktop monitors and built in display support (Mac or Windows) for remote viewing over a LAN, modem (28.8 usually), or ATM; especially for doctor's access from home. In fact, many are looking for this feature but the transmission time is long, especially for multiple images.

Only one company (Brit Systems) used a display card aimed for artist's as the mode to drive the medium resolution medical displays. They used "Artists Graphics" and it performs comparable to the Dome for displaying and contrast/brightness in software vs. hardware; about 1/3 to 1/4 the cost!

Patient Record Systems

Patient record systems are widely available from several suppliers for various platforms; DOS, Windows, Mac, Sun. The thrust seems to be for billing, tracking what procedures were done for a patient, and allowing input from the medical staff in text and voice. It is not really used as a tool for analysis/diagnosis.

None of the systems appear to be able to look across patients, few can give more than "the standard" interface to a user, none support more that simple password protection, and none provide any privacy. A few have connected to the Internet and believe that a password and read only is sufficient protection from the Internet community. Only a few know the meaning of encryption.

Teleradiology

The emerging "radiology work station" consists of a workstation with 2-4 display monitors of medium resolution (1200x1600x8bit) with the trend moving to higher resolution (2000x2500x8bit) with some interest in the brighter displays (> 100 fL), connected via a LAN to an image server. Some of the high end display boards offer intensity calibration between displays (Dome).

The concept is to acquire the image without film, analyze it, and send the images with the radiologist's interpretation to other locations in the hospital. The radiology server also supports remote query for images via the patient name or id, but none that I examined did any kind of content searching or comparisons across patients.

Standards for "Medical Computing"

Support for two standards were widely claimed by products on the exhibit floor; PACS and DICOM.

DICOM (Digital Imaging and Communications in Medicine) is the industry standard for transferring medical images and related information between computers and allows digital communication between diagnostic and therapeutic equipment from different manufacturers. Joint effort of ACR-NEMA (American College of Radiology, National Electrical Manufacturers Association)

PACS (Picture Archiving and Communication System)

DICOM/ATM Telemedicine Demonstration

(Penn State, U.S. Army Medical Research and Materiel Command, Loral Medical Imaging Systems, Walt
Reed Army Medical Center, Sprint) in InfoRad

The demonstration was housed in an Army tent in the InfoRad exhibit, complete with sand bags. Various images are transmitted to the other remote sites including video from the patient's bedside and diagnosed collaboratively; historical data about the patient is accessed via the remote MDIS (Medical Diagnostic Imaging Support). The system utilizes an open architecture workstation based on standards-based design, in particular DICOM and PACS.

Acuson Telemedicine Demonstration

(Acuson, Memphis Hospital, Medical School in Memphis, AT&T) in Acuson Exhibit

Used ATM to show lab room, staff, and data display at remote hospital with live audio/video, while local demonstrator would periodically say "send that image". The high resolution images were then sent via tc
over a T1 line to a local high resolution display for local analysis.

Other Impressions

Quote of the conference, courtesy of Medical Management Sciences:

> *"America's oldest and largest management firm devoted exclusively to maximizing radiologists' personal income"*

Raw Notes:

Monday, RSNA

Images on Call- Teleradiology - Mac/PC 8 bit window on 12 bit data, Supports Dome.

Siemens - Own display and card, 8 bit 2kx2k gray scale, Sparc 20 based display card. Sparc 10 view station with 2 monitors..

Kurzweil, AI technology, voice recognition, PC based.

Data Ray (makes Kodak medical monitors)
1200x1600, 65 fL, 34% transmittance, 21"
2048x2560, 150 -200 fL, 11.6x15.5", 47% transmittance, $7500, 21"
2048x2560, 14.5x18.5", also
located in Denver, interested in working with us

Dome (display cards)
2x2.5k, 16 bit onboard -> 8 bit display, Sun & Mac now, PCI 3/95
1200x1600, 16->8 onboard, Sun ($4400), PCI & Mac ($3300), with luminance calibration.
Output to all monitors is true 8 bit.

1200x1600x8 bit, window level software, PCI, 1or2 head, $3000.
1024x1280x16 bit->8 bit display, RX20, PCI, $4000
1200x1600x16 bit->8 bit display MD-EISA, 1 head, $5000
1728x2304x16 bit->8 bit display, $7000
2x2.5 K x 8 bit, PCI, April
Windows drivers now, NT - February

Most medium display monitors are 1200x1600, 75 fL. ------

Image Systems (displays)
2x2.5 k, 8 bit, 12x16", $6000.
Says you should look for brightness and contrast specifications. Located in Minnesota
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Tech Source (External Display Box)
Sun, adapter card plugs into sun and box is external. PCI adapter card at least 6 months away.
Claim that you need 200 fL minimum to display 10-12 bits. In the next year we will see several 12-16 bits being displayed on 200-250 fL displays with wide availability in 2 years.

Orwin (gray scale displays, makes control tower displays) New York
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XRS Scanner
CCD, floor model, Z-shape, Mac/PC/Unix software.

Polaroid Medical Imaging - carbon based XRay printing, no silver, dry process
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Line Systems
Scanner capture software, Vision Ten with V10 card, SCSI later, $3-5k. maybe DICOM output.

Radman
Radiology records, DOS based, shifting to WIN95 and leapfrogging Windows. Specilizes in records and teleradiology
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Medial Management Sciences
" America's oldest and largest management firm devoted exclusively to maximizing radiologists' personal income"

SMS
Medical image management, digital-> operating room before XRay developed.

Olicon
Takes OEM hardware provides software and system integration, installs and supports in hospital. Wide promotion of "Patient Record" orientation. Primarily aimed for hospital billing, action tracking for individual cases, legal defense.

Monday Impressions:

Many workstations are multiple display, 2 and 4 very common. Radiologist paid per image and images can be staged ahead so that he is not waiting for the display. Some demand for remote home use. Two standards used: PACS-Picture Archiving Communication System and DICOM. There is some evaluation via either NIH or FDA?

Patient records are not aimed to aid diagnosis, track treatment for effectiveness, or for evaluating the decisions.

No way to search across patients, the entire access is via the name or id number. No content searching.

Simple password security, radiologist is only one who can enter analysis on images, all users see the same information in the same format. No privacy, patient name is accessible to all at all times, data is transmitted in display form with no encryption.

Major display suppliers are: Data Ray, Image Systems, MegaScan.
Major display card supplier is Dome.

Tuesday, RSNA

Digital Dictation - Dictophone, Sudbury, Lanier

Swearington Software
PC based Radiological Management System, billing!

Hewlett Packard
Image Analysis and Visualization
"Complete Set of 2D&3D Image Processing Functions", about 120 or so, they weren't sure, done by Sensor (Unix based, works on other platforms), NIH funded, Sterling Va. Measures area, density, distances, etc. Windows NT in a year.

Vidar Systems Corp

CCD Scanner, modern, desktop, uses Image Pro Plus software from Media Cybernetics, Silver Spring MD ($2k)

Internet Interest Groups
comp.protocols.dicom
sci.med.radiology
sci.image.processing
sci.med.physics
alt.image.medical

SGI
Promoting SGI hardware and OpenGL as the tools for powerful medical workstations. Medical products group started 9 months ago. Only medical demo was from ISS - Med School dept in Singapore demonstrated a virtual workbench for surgery simulation. Promoting SGI's real time audio and video as enabling technologies for worldwide telemedicine.. Only standard color displays, no GRAY SCALE! or multiple display stations.

Star Technologies
Film digitizer - Vidar, PC based, Twain support, DICOM data format.
OS-2/user interface, Windows under OS-2. $5-8k for DICOM server. Uses Dome card and onboard functions.

Loral Imaging Systems
Vantage System, Sun server, Mac stations, radiology image management
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ALI Technology
Says that "Project Spectrum" is to look at merging lab data, images, patient records, analysis, diagnosis etc. Consortium of IBM, Kodak, Mallinkrodt Institute of Radiology at Washington University.

Acuson
Demonstrated remote telemedicine collaboration involving Memphis Medical hospital, Univ Med School and consultation on the floor. Images via T1, real time collaboration via ATM

Medical Display Systems
Scanning software - DICOM-image retrieval-remote display. Complete systems, Minneapolis
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Trying to track down Tuesday talk which never showed, Jon Trueblood, Medical College of Georgia.

Wednesday, RSNA

InfiMed
10 bit display (Image Systems), InfiMed board, 2100 lines

Image Data Corp
MultiView for Windows/Mac, remote view/home etc. 28.8 modem.

Cemax
Software, levels of security, custom by user, Sun based, networking. Total solution.

Brit Systems, Dallas

Scanner software, C++, DICOM, RS600 primarily, Windows supported. Vision Ten. $2500.
Uses Artists Graphics board 1200x1600 $1000!
Derived from University of Texas, Southwestern.